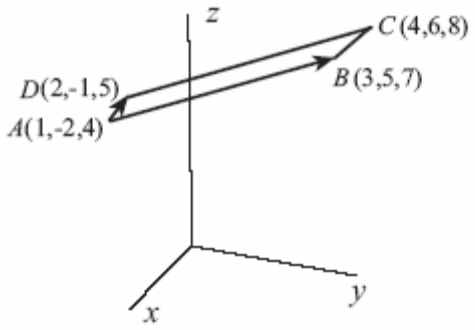
QUIZ #3 – Solutions
Each problem is worth 5 points

1. The lines are parallel since a vector along each is $(3, 4, 1)$.
Since $(1, 0, -2)$ and $(-1, 2, -5)$ are points on the lines, a second vector in the plane is $(1, 0, -2) - (-1, 2, -5) = (2, -2, 3)$.
A vector normal to the plane is:
$(3, 4, 1) \times (2, -2, 3) = (14, -7, -14)$, or re-scaling, $(2, -1, -2)$.

2. The area of the parallelogram is
$|\mathbf{AB} \times \mathbf{AD}| = |(2, 7, 3) \times (1, 1, 1)| = |(4, 1, -5)| = \sqrt{42}$.



3. If (x, y) is made to approach $(1, 1)$ along the straight lines $y - 1 = m(x - 1)$,

$$\lim_{(x,y) \to (1,1)} (x^2 - 2x - y^2 + 2y)/(x^2 - 2x + y^2 - 2y + 2)$$

$$= \lim_{x \to 1} ((x-1)^2 - (y-1)^2)/((x-1)^2 + (y-1)^2)$$

$$= \lim_{x \to 1} ((x-1)^2 - m^2(x-1)^2)/((x-1)^2 + m^2(x-1)^2)$$

$$= \lim_{x \to 1} (1 - m^2)/(1 + m^2) = (1 - m^2)/(1 + m^2)$$

Since this result depends on m, the original limit does not exist.

4. $\partial f/\partial x = 3x^2/y + \sin(yz/x) + x \cos(yz/x)(-yz/x^2)$

$= 3x^2/y + \sin(yz/x) - (yz/x) \cos(yz/x)$

5. $\nabla f = exp(x+y+z)\,\mathbf{i}\hat{} + exp(x+y+z)\,\mathbf{j}\hat{} + exp(x+y+z)\,\mathbf{k}\hat{} = exp(x+y+z)\,(\mathbf{i}\hat{} + \mathbf{j}\hat{} + \mathbf{k}\hat{})$